Remarks

The amendments set forth herein are provided solely to clarify the invention as filed and set forth in the pending claims in order to comply with applicable statutes and regulations. The amendments are not intended to limit the invention or preclude the application of equivalents which Applicant may be entitled to under law.

Status of the Application

Claims 1-6 and 8-11 were rejected under 35 USC 103(a) as being unpatentable over Ben-David WO 01/95544 in view of Conner US 5,625,424 *(the 5,625,434 number cited by examiner appears to be a typo)* and in view of Yamuchi US 6,809,714.

Technology review:

Before proceeding with the specific claim rejections, applicant believes that a brief review of the present disclosure and the cited art of Ben-David, Conner, and Yamauchi will help clarify the issues and facilitate prosecution.

The present specification teaches an improved (lower cost) manual method to calibrate a color filter wheel video projector for color accuracy by allowing the user to manually control (adjust) the color wheel delay timing of the projector. As applicant teaches in specification paragraph [0008], this approach avoids the additional optical sensors and expensive and hard to locate test equipment, such as oscilloscopes, used by prior art projector color wheel delay timing adjustment techniques.

As discussed in the specification, the timing of the projector color filter wheel (color wheel) rotation relative to the image forming elements (the digital mirror device) of the projector can sometimes be slightly off, resulting in distorted color when a digital mirror image indented for a first color wheel color is accidentally displayed when the color wheel is instead displaying a different second color. The specification teaches (paragraphs [0017] and [0018]) that when this occurs, an image that would otherwise appear pure red on the screen when the wheel timing is correct will instead appear by

eye to have some (improper) color such as yellow or purple. The specification teaches a way to correct this in which a user can look at an on-screen display (OSD) of a reference image displaying various intensity (gray) levels (or shades) of the primary colors (red, green, and blue), see that the colors are being displayed improperly, and then manually use control keys on the projector to alter (adjust) the timing of the color wheel (adjust the color wheel delay) to make corrections. That is, the user can correct the color wheel delay to make the OSD display of various shades (gray levels) of what should look red actually appear red, the OSD display of various shades (gray levels) of what should look green actually appear green, and the OSD display of various shades (gray levels) of what should look blue actually appear blue. When this is done, the timing of the color wheel will be correct, and the projector can then project other visual material with good color accuracy.

Thus the present art represents an advance in projector color wheel delay calibration technology, and the proper scope of inquiry is an examination of prior projector color wheel delay calibration technology.

By contrast, although Ben-David teaches higher than normal high fidelity (true color) displays that use more than the standard red, green, blue, color wheel filters to achieve higher than normal standards of color accuracy, he otherwise is silent on how the timing delay of his color wheels is to be adjusted. By his silence, it must be assumed that he intended to use prior art calibration techniques, such as prior art optical sensors and oscilloscopes. Since Ben-David's invention was focused on color wheels that would use more than the standard three colors, his silence on unrelated matters would appear reasonable. Ben-David focused his energy on producing a premium projector device. Prior art color wheel delay instrumented adjustment methods were adequate for his purposes, and indeed his focus on premium devices probably (if he had thought about the topic at all, which apparently he did not) would have led him away from the present low-cost manual adjustment art.

Thus examiner's arguments supporting the concept that Ben-David's device could render the color "gray" are irrelevant to the present discussion. It is stipulated that Ben-David's device could in fact render a great many different colors. The

question is, does Ben-David teach any art relevant to color wheel delay adjustment, and more specifically art relevant to manual color wheel delay adjustment techniques that do not require extra sensors and analytical equipment. Applicant has searched Ben-David for this teaching, and has found noting relevant to these issues.

Conner is concerned with the motors used to drive color wheels. Although clearly such wheels must perform with high accuracy, Conner is concerned with automated digital controllers. Connor also fails to teach manual adjustment methods or manual interfaces to achieve any sort of color wheel delay adjustment.

Indeed, contrary to examiner's assertion, the sections of Conner (Co. 2, lines 38-47) cited by examiner simply reiterate prior art already disclosed by applicant in specification paragraph [0006] and Figure 1. Namely that the color wheel speed and timing is controlled by a motor and a motor controller. Applicant stipulates that the motor controller controls the speed and phase of the color wheel. Indeed, if the motor and motor controller did not do this, the present invention would be useless, because once adjusted, the filter wheel would immediately come out of adjustment again within a fraction of a second.

Conner is completely silent on manual methods to adjust the color wheel delay value (phase) of the color wheel. He fails to teach generating any type of on-screen display that can be evaluated by the user, and also fails to teach any type of user interface on the projector that would allow the user to manually increase or decrease the color wheel delay value in order to achieve optimal projector performance.

In essence, neither Ben-David nor Conner contribute any more to this discussion than to reiterate art already admitted by applicant, namely that there exist color wheel projectors with color wheels that are controlled by precise motors and controllers. Although color wheel projectors with precise motors form some of the components of applicant's present invention, they are not the invention itself. Rather, as previously discussed, the invention is how to easily and cheaply calibrate a color wheel projector that uses a reasonably accurate motor and controller.

Applicant respectfully submits that Yamauchi doesn't teach color wheels of any sort, and thus cannot be teaching art relevant to color wheel delay adjustment. Rather, Yamauchi teaches how to solve a different type of color adjustment problem, color temperature, using a display that doesn't even have color wheels.

Yamauchi is concerned with means to adjust the color temperature of color liquid crystal displays. *(Yamauchi col. 2, lines 3-5, col. 2 line 42, col. 3 line 28, col. 7 line 48. Note further that Yamauchi defines "chromaticity coordinates" as "color temperature" in col. 2, line 42).* His displays don't use color wheels, and his methods do not adjust the timing of color wheels. Rather his displays are liquid crystal displays that are capable of simultaneously rendering red, green, and blue signals, and in which the red, green, and blue signals can in fact be simultaneously be presented at the same time, independent of each other.

What is color temperature? The human eye perceives "white" to be a different mix of colors depending upon the local environment. That is, the "white" color of daylight actually is a different mix of red, green, and blue colors, that differs from (is bluer than) than the "white" color of an incandescent lamp. Color temperature is more of an issue with computer monitors, rather than projectors, due to the fact that a computer monitor user typically uses a computer monitor in the presence of background illumination such as a window to the outside, or an room lamp. This background illumination provides reference wavelengths that the user's eye subconsciously uses to judge what "white" should be. Thus if the "white" of a computer monitor is different from the "white" provided by background light, the computer monitor display looks unnatural. Yamauchi teaches ways to independently scale the intensity of his independent red, green, and blue liquid crystal display to achieve more naturally looking color temperatures.

By contrast, projectors are generally used in dark environments. In a dark environment, there is not a large amount of background illumination to bias the user's eyes, and the user usually will accept the "white" shown by the projector as being correct. As a result "color temperature" is less of an issue with projector systems.

Applicant is thus not addressing color temperature, but rather is addressing the very different color calibration problems caused by improper color wheel delay settings.

While an improper color temperature can cause images to look somewhat bluer or redder than they should be, the colors are otherwise natural in that red remains red, blue remains blue, and green remains green. By contrast, improper color wheel delay settings can totally scramble colors away from their natural values.

For example, if the color wheel timing delay is very far off, a "red" image on the image modulator could be projected though a blue filter on the color wheel, and a "green image" on the image modulator could be projected through a red filter on the color wheel, and a "blue" image on the image modulator could be projected through a green filter on the color wheel, producing images that are extremely distorted. For example, an image of a green apple tree with red apples against a blue sky would instead be projected as an image of a red apple tree with blue apples against a green sky. This image would appear to be very wrong, and the techniques of Yamauchi, which simply adjust the independent RGB components of the signal up or down to try to match ambient light conditions, could be useless for correcting this type of problem.

By contrast, the techniques of the present art would allow the user to increase or decrease the color wheel delay to now make the red color wheel filter appear properly when the image modulator is displaying a red image, make the blue color wheel filter appear properly when the image modulator is displaying a blue image, and make the green color wheel filter appear properly when the image modulator is displaying a green image.

Thus Yamauchi teaches a different solution for a different problem using a different apparatus. He is not concerned with adjusting the color wheel delay of a projector and did not provide a user interface that had any color wheel delay controls.

Claim rejections, 35 USC 103(a)

MPEP 706.02(j): To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). See MPEP 2143 - 2143.03 for decisions pertinent to each of these criteria.

Regarding claim 1: The 35 USC 103(a) rejection of claim 1 as being unpatentable over Ben-David in view of Conner and further in view of Yamauchi is overcome in part and traversed in part. To overcome, claim 1 has been amended to teach that the projector has <u>a user interface for manually</u> adjusting a color wheel delay of the projector.

Applicant respectfully submits the combination of Ben-David, Conner, and Yamauchi fails the obviousness criteria of MPEP 706.02(j) for claim 1, as amended, on all three criteria:

Criteria 1, suggestion or motivation: There is no suggestion in either Ben-David, Conner, or Yamauchi for <u>a user interface for manually</u> adjusting a color wheel delay of the projector. Moreover, there is no suggestion in either Ben-David, Conner, or Yamauchi to project an on screen display, and have a user use this display to manually adjust the color wheel delay of the projector. Thus the motivation to combine Ben-David, Conner, and Yamauchi is not found in any of these sources, but rather is improperly derived from applicant's own teaching.

Criteria 2, no reasonable expectation of success: There is no reasonable expectation of success. The methods of Yamauchi, which examiner relies upon for any on-screen display or user interface teaching, teach methods for independently varying

the Red, Green, or Blue components of the visual signal in order to vary the color temperature of the signal. As discussed in detail, such methods would be totally useless for correcting errors in color wheel delays, which can result in totally wrong colors such as red being mapped into blue, green being mapped into red, and blue being mapped into green.

Criteria 3, failure to teach the present claim limitations: The prior art references when combined do not teach the present claim limitations. Although Ben-David does teach a color wheel projector, he is totally silent on ways to manually adjust the delay timing of his color wheel to correct color errors. Conner teaches a motor and controller, but is also silent on how the timing of his controller and motor may be manually adjusted to correct color errors caused by improper delay timing. Yamauchi, who teaches a system without a color wheel, is also quite silent on ways to manually adjust the delay timing of a color wheel to correct color errors, because there is no color wheel. Thus none of the prior references, when combined, teach the present "user interface for manually adjusting a color wheel delay" limitation.

Applicant respectfully traverses and overcomes the 35 USC 103(a) rejections of claims 2-5 in view of Ben-David, Conner, and Yamauchi on the basis that these claims are dependent claims to claim 1, and thus inherit the limitations of claim 1.

Regarding claim 6: The 35 USC 103(a) rejection of claim 6 as being unpatentable over Ben-David in view of Conner and further in view of Yamauchi is overcome in part and traversed in part. To overcome, claim 6 has been amended to more specifically teach that the method is a method for manually adjusting the color wheel delay of a projector, that the method involves observing the OSD, and manually adjusting using a user interface connected to the control circuit.

As previously discussed for claim 1, applicant respectfully submits the combination of Ben-David, Conner, and Yamauchi fails the obviousness criteria of MPEP 706.02(j) for claim 6, as amended, on all three criteria:

Criteria 1, suggestion or motivation: There is no suggestion or motivation in either Ben-David, Conner, or Yamauchi for any type of manual method to adjust the color wheel delay of a projector. Ben-David and Conner totally fail to teach that it would be desirable to make any sort of manual color wheel adjustment, and Yamauchi, who teaches adjusting color temperature problems on a non-color wheel system, can hardly be suggesting correcting color problems that are unique to color wheel projection systems. Thus, as per claim 1, the motivation to combine Ben-David, Conner, and Yamauchi is not found in any of these sources, but rather is improperly derived from applicant's own teaching.

Criteria 2, no reasonable expectation of success: There is no reasonable expectation of success. The methods of Yamauchi, which examiner relies upon for any on-screen display or user interface teaching, teach methods for independently varying the red, green, or blue components of the visual signal in order to vary the color temperature of the signal. As previously discussed in detail, such methods would be totally useless for correcting errors in color wheel delays, which can result in totally wrong colors such as red being mapped into blue, green being mapped into red, and blue being mapped into green.

Criteria 3, failure to teach the present claim limitations: The prior art references when combined do not teach the present claim limitations. Although Ben-David does teach a color wheel projector, he is totally silent on ways to manually adjust the timing of his color wheel to correct color errors. Conner teaches a motor and controller, but is also silent on how the timing of his controller and motor may be manually adjusted to correct color errors. Yamauchi, who teaches a system without a color wheel, is also quite silent on ways to manually adjust the timing of a color wheel to correct color errors, because there is no color wheel. Thus none of the prior references, when combined, teach the present "user interface for manually adjusting a color wheel delay" limitation.

Applicant respectfully traverses and overcomes the 35 USC 103(a) rejections of claims 8-11 in view of Ben-David, Conner, and Yamauchi on the basis that these claims are dependent claims to claim 6, and thus inherit the limitations of claim 6.

Support for the "a user interface" and "manually" limitations for amended claim 1 can be found in specification paragraphs [0010], [0016], [0017], and [0018] and others. Note the phrases such as "the user can control", "the user can decrease the color wheel delay value with control keys of the projector", and "the user can increase the color wheel delay value with the control keys of the projector" in [0017]. These control keys of the projector are a user interface.

New claims:

New claims 12 and 13 find support in original claims 1 and 6, and are in fact simply original claims 1 and 6 amended to now contain the previously discussed user interface limitations.

New claim 14 recites with more specificity that the user interface comprises control keys, and finds support in specification paragraph [0017].

New claim 15 recites with more specificity that the on-screen display (OSD) also displays an adjustment check that allows the user to see how much the color wheel delay value has been adjusted, and finds support in specification paragraph [0019] and figure 4 (38).

Thus, it is submitted that the claims as amended are in condition for allowance, and, accordingly, allowance is respectfully requested. If the examiner sees any further impediment to allowing the claims, a telephone conference is hereby requested with Dave Stevens at (408)288-7588.

The Commissioner is hereby authorized to charge any additional fees due or credit any overpayment to Deposit Account No. 50-2421.

Sincerely,

Dated: September 20, 2007

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